Digitized by the Internet Archive
in 2009 with funding from
University of Toronto

http://www.archive.org/details/n06radium03came

RM
859
R313
v.3
no.6
c.1
GERSTS

RADIUM

EDITED BY
CHARLES H. VIOL, Ph. D.
AND
WILLIAM H. CAMERON, M. D.

VOL. III SEPTEMBER, 1914 No. 6

CONTENTS

Contribution on the Biological and Pathological Action of Soluble Radium Salts, II, By Frederick Proescher, M. D., and B. R. Almquest, M. D. - - - - - - - 85

Reviews and Abstracts - - - - - - - - - 96

Notes and Comments - - - - - - - - - 99

LIBRARY
NOV 1 3 2001
UNIVERSITY OF TORONTO

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

RADIUM

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY, PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES.

Edited and Published by Charles H. Viol, Ph. D. and William H. Cameron, M. D., with the assistance of collaborators working in the fields of Radiochemistry, Radioactivity and Radiumtherapy.

Subscription $2.50 per year, or 25 cents per copy in the United States and Canada; in all other countries $3.75 per year.

Address all communications to the Editors, Forbes and Meyran Avenues, Pittsburgh, Pa.

VOL. III SEPTEMBER, 1914 No. 6

CONTRIBUTION ON THE BIOLOGICAL AND PATHOLOGICAL ACTION OF SOLUBLE RADIUM SALTS II

FREDERICK PROESCHER, M. D., and B. R. ALMQUEST, M. D.

RESUME OF THE EFFECT OF SOLUBLE RADIUM SALTS ON THE CIRCULATING BLOOD CELLS OF WHITE MICE AND WHITE RATS.

Mouse No. 8 and mouse No. 9 receiving 50 micrograms of radium element each and mouse No. 10* 100 micrograms, showed the following changes in the blood:—

RED CELLS: Mouse No. 8 showed a considerable increase in the red cells 24 hours after injection, followed by a constant decrease to about one-half of the normal number ten days after injection.

Mouse No. 9 did not show any increase in red cells but a constant decrease to somewhat less than mouse No. 8.

Mouse No. 10 did not show any appreciable change in number of red cells.

HEMOGLOBIN: Showed in mice Nos. 8 and 9 a marked decrease.

No. 10 showed a slight increase.

LEUCOCYTES: In all three mice the leucocytes were suddenly reduced (⅛ to ⅓) 24 hours after injection. Mice Nos. 8 and 9 showed a marked diminution to 100 and 125 respectively.

Mouse No. 8 on day of death showed an increase to 200.

Mouse No. 10 showed a decrease to 1125.

RELATIVE LEUCOCYTE COUNTS: The neutrophiles in mouse No. 8 and mouse No. 9 showed considerable increase 24 hours after

*The blood count of this mouse is rather incomplete as during the three days prior to death, no count was made.

injection, followed by a constant decrease, disappearing in both mice three days prior to death.

In mouse No. 10 only a decrease in neutrophiles was noted.

The eosinophiles disappeared in mice Nos. 8 and 9 the third day after injection.

The medium sized lymphocytes showed first a slight increase but disappeared entirely the seventh day after injection.

The small lymphocytes were constantly increased and remained as the only form of leucocytes in the blood until death occurred.

Rats Nos. 1, 2, 3, 4, 5 and 6 receiving 40, 60, 80, 100, 150 and 200 micrograms radium element respectively showed the following changes in the blood:—

Red Cells: Rats Nos. 1, 2, 3, 4 and 5 showed first an increase then a more or less marked decrease, while rat No. 6 showed a decrease only.

Hemoglobin: In every instance the hemoglobin was markedly reduced. Nos. 3 and 6 showed most marked reduction (50% to 60%).

Leucocytes: In every case the leucocytes were markedly diminished.

Relative Leucocyte Count: The neutrophiles after injection were somewhat reduced, later they were more or less increased.

The eosinophiles showed a tendency toward a more or less marked increase.

The lymphocytes, especially the small ones, showed a decided increase, the large and medium cells did not show marked fluctuation.

In conclusion, we can say that radium in large fatal doses, namely, 2,000 to 4,000 micrograms of radium element per 1,000 gram living weight, as in case of white mice, show first a short period during which the red cells are increased, this being followed by a more or less marked destruction. The hemoglobin is also proportionately reduced.

In case of white rats, in which 300 to 1100 micrograms of radium element per 1000 grams living weight were given, considerably less in proportion to body weight than in mice, and in which death occcurred more slowly, an increase of the red cells for a short period was observed, followed by more or less reduction. However, in the smaller doses, there seems to be later on an increase in the red cells again. The hemoglobin content showed the same variation.

Individual differences are also observed as rats Nos. 3 and 4, which received smaller amounts than Nos. 5 and 6, showed a more marked reduction in number of red cells than the latter.

The leucocytes were in both mice and rats considerably decreased, in mice more marked than in rats, but a complete leucopenia was not observed. The leucocytes in rats, shortly before death, were more or less increased.

According to the mouse experiments, the most radio-sensitive

cells are the eosinophiles which disappeared entirely on the third day after injection.

The neutrophiles seem to be first stimulated but later on entirely destroyed as after eight days they disappeared entirely.

The same is true of the medium-sized lymphocytes which were at first slightly stimulated, but, however, disappeared at the same time as the neutrophiles.

The small lymphocytes are the most radio-resistent as they were still present at time of death.

The change in the relative leucocyte picture in the white rats is different than in the white mice, apparently due to the smaller doses of radium given per 1000 grams living weight, or possibly individual differences.

The neutrophiles shortly after injection showed a more or less marked reduction but after a few weeks, were increased again.

The eosinophiles were stimulated and in rat No. 5, 24 hours after injection, there was a very marked increase from 2 to 11%.

The lymphocytes, especially the small ones, showed a marked relative increase, same as noted in white mice.

The large and medium lymphocytes showed little variation.

No regenerative or degenerative forms of red cells were observed in the blood of either the rats or mice.

The blood platelets showed no appreciable changes.

No morphological changes in the leucocytes were noted.

PATHOLOGICAL FINDINGS.

(A) Macroscopical. No changes were found at the site of the injection. The pelts of the animals did not show any change such as roughening of the hair or alopecia. The loss in weight was very pronounced in all the rats, the loss for rat No. 4 being nearly 50%. Mice Nos. 3, 5 and 10, which were the only ones weighed, showed also considerable loss in weight.

In all the animals the subcutaneous fat tissue was considerably reduced. The skeletal muscles in mice Nos. 8 and 9 and in all the rats were of a pale appearance. Macroscopical changes of the chest organs were noted only in mouse No. 9 and rat No. 6, where a hyperamic condition of the lung was found. The abdominal organs in mice Nos. 8 and 9 showed a marked anaemia of the parenchymatous organs. The same was noted in a varying degree in rats Nos. 1, 2, 3 and 4. The spleen in mice Nos. 8 and 9 and in rats Nos. 1, 2, 3 and 4 was markedly reduced in size; in mouse No. 10 and rats Nos. 5 and 6 it was somewhat larger than normal and in rats Nos. 5 and 10, hyperaemic.

The bone marrow of the long bones was of a normal semi solid consistency and of a reddish grey color in rats Nos. 1, 2, 3, 4 and 5. In rat No. 6 it was darkened and of a thin consistency. In mice Nos. 8 and 9 it was of a reddish brown color, semi solid, and in mouse No. 10, dark reddish color and half fluid.

(B) Microscopical Findings. The organs were fixed in formalin and alcohol, embedded in paraffin and the section stained with eosin-haematoxlyn, van Gieson and methylgreen-pyronin. The bone marrow was fixed in Zenker's fluid and Zenker-formalin and

stained with Giemsa solution; smears were also made and stained with a methyl alcohol solution of eosin-methylene-blue-toluidin-blue and Giemsa solution.

HAEMOPOETIC SYSTEM.

LYMPH GLANDS. The peripherial and internal lymph glands of all the rats, and mice Nos. 8, 9 and 10 showed the following changes: A more or less marked hyperaemia, a rarification of the follicle lymphocytes and a partial transformation of same into endotheloid cells. The stroma and sinus structures showed fibroblastic proliferation. Degenerative changes consisting in karyorrhexis and karyolysis of the nuclei and small circumscribed necrotic areas were seen, also formation of plasma cells (Marschalko type) and lymphocyties irritation cells were noted. Many cells were filled with a yellowish green clumped pigment.

SPLEEN. Rats Nos. 1 and 5, showed a slight distention of the blood vessels combined with small hemorrhages. Rat No. 6 and mice Nos. 8, 9 and 10 showed a marked blood engorgement. Hemorrhages were found only in the pulp and around the follicles. The follicle lymphocytes were partially transformed into endotheloid cells. No pronounced follicle atrophy was noted. Further, there was noticed a fibrillary-fibrous proliferation of the stroma in the pulp. The trabeculi and the walls of the arterial blood vessels were thickened. Myeloid transformation of the pulp was not seen but many plasma cells were observed throughout the pulp. A small necrotic area was seen in rat No. 5. Rat No. 6 and mice Nos. 8, 9 and 10 showed a great many pigmentated cells filled with a clumped pigment.

BONE MARROW.

Rats Nos. 1 and 2 showed an increase in the neutrophilic myelocytes besides many eosinophilic myelocytes and megakaryocytes, the neuclei of the latter being somewhat indistinct and the chromatin clumped. No changes were noted in the lymphoid cells.

Rats Nos. 2, 3, 4 and 5 showed a marked decrease in the lymphoid cells and here and there small necrotic areas. The bone marrow of rat No. 6 consisted almost entirely of red cells with a few lymphoid-myloid cells and megakaryocytes. The blood vessels were markedly distended and in some places ruptured. In mice Nos. 8, 9 and 10 this change was even more pronounced as lymphoid-myloid cells almost completely disappeared, the vessels distended enormously and ruptured in places.

CIRCULATORY AND RESPIRATORY SYSTEM.

The heart did not show any pronounced changes except in rats Nos. 1 and 2 wherein a slight fatty metamorphosis was noted.

The lungs in rats Nos. 1 and 5 showed a slight distention of the capillaries of the alveoli. The stroma was somewhat thickened. The lungs in rat No. 6 and mice Nos. 8, 9 and 10 showed a pronounced hyperaemia, the bronchial arteries and bronchial veins being less markedly distended than the venous artery. Smaller and larger confluent haemorrhages were also noted.

PARENCHYMATOUS ORGANS.

LIVER. In rats Nos. 1, 2, 3 and 5 the liver showed multiple cen-

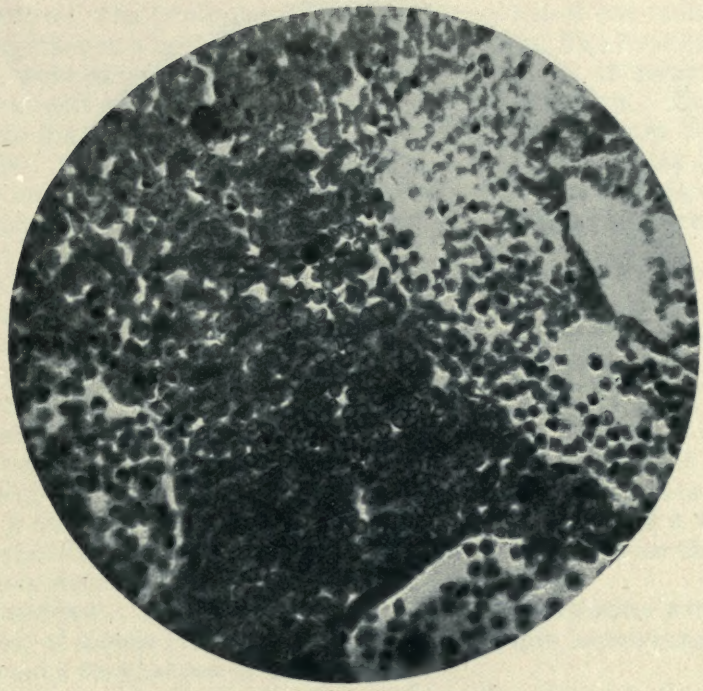

Figure I.

Bone Marrow. Mouse receiving 100 micrograms of radium element. Showing extensive hemorrhage and rupture of vessel. Leitz Oil Immersion 1/12, Ocular 4.

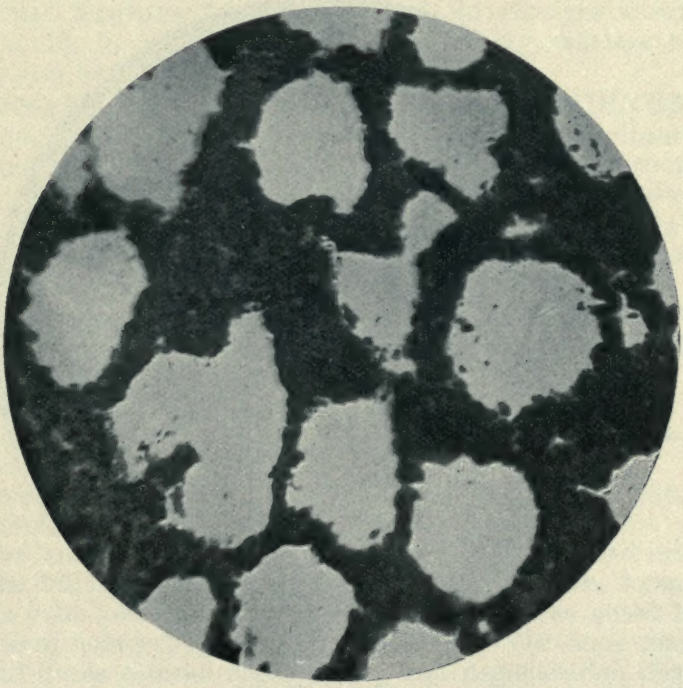

Figure II.

Lung. Rat receiving 200 micrograms of radium element. Enormous engorgement of capillaries. Leitz Objective 4, Ocular 4.

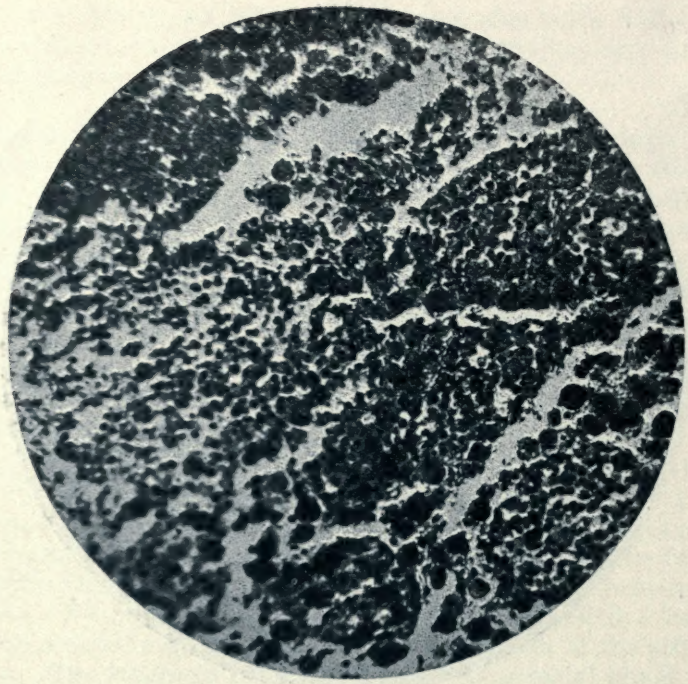

Figure III.

Lymph gland. Rat receiving 100 micrograms of radium element. Showing proliferation of endothelium cells and many pigmentated cells. Leitz Objective 5, Ocular 4.

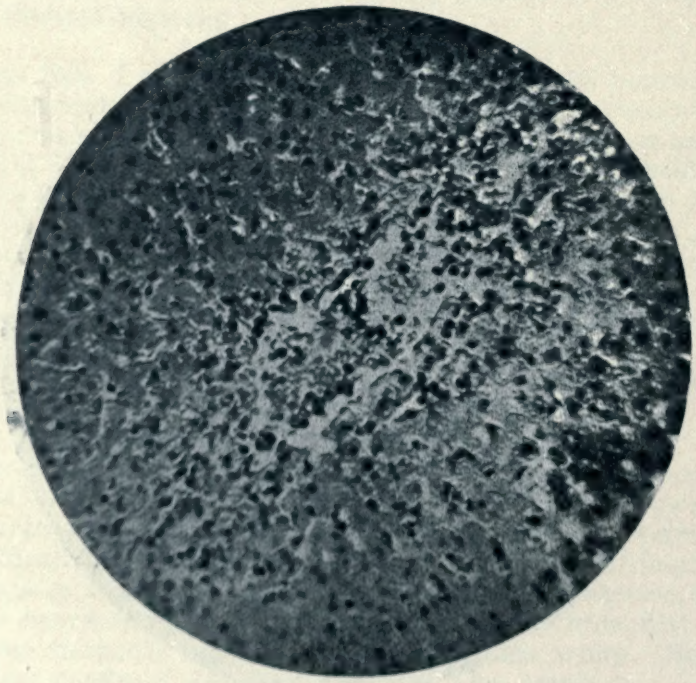

Figure IV.

Liver. Rat receiving 100 micrograms of radium element. Showing central necrosis of acinus. Leitz Objective 5, Ocular 4.

tral necrosis. The protoplasm around the center of the acini was fused together in a homogenous pink stained mass. The liver cells in general were somewhat indistinct and the neuclei of many cells were enlarged and showed karyorrhexis and karyolysis. The vessels were distended and showed a great many leucocytes besides red cells. No necrosis was found in the rat No. 4. Rat No. 6 showed only a marked hyperaemic condition with multiple small hemorrhages but no necrosis. The same was found in mice Nos. 8, 9 and 10.

KIDNEY. In rats Nos. 1, 3 and 5 there was found fatty metamorphosis of the tubuli contorti and Henle's loops. Rat No. 6 and mice Nos. 8, 9 and 10 showed a marked hypraemia. The capillaries of the glomerule were markedly distended.

PANCREAS. In rats Nos. 2 and 6 and in mouse No. 10 a few small necrotic areas were found.

SUPRARENAL CAPSULE. The cells of the cortex did not show any change. The cells of the medullary substance in rats Nos. 1, 3, 4, 5 and 6 showed no chromreaction. In rat No. 2 a slight chromreaction was present. Mice Nos. 8, 9 and 10 likewise showed no chromreaction of the medullary substance.

INTESTINES. No changes were found in the intestine with the exception of mouse No. 9, which showed multiple hemorrhages in the muceous membranes of the coecum.

UROGENITAL ORGANS. In the male rats Nos. 4 and 5 there was found in the testicle an almost complete destruction of the spermatozoa and spermatogenetic cells. In the female rat receiving 60 micrograms no change was found in the ovaries.

CENTRAL NERVOUS SYSTEM. Showed no changes except in mouse No. 10, in which there was a slight hyperaemia of the meninges and brain substance.

SUMMARY OF THE PATHOLOGICAL FINDINGS.

In conclusion we can say that by giving soluble radium salts in fatal and superfatal doses the following conditions were noted:

The parenchymatous organs, after fatal doses, showed a slight, and after superfatal doses, an enormous, hyperaemia combined with hemorrhages and pronounced parenchymatous cell degeneration.

Parenchymatous cell degeneration and necrosis were found in the livers of all the rats with the exception of rat No. 4 and mice Nos. 8, 9 and 10. Rats Nos. 2 and 6 and mouse No. 10 showed small necrotic areas in the pancreas.

The suprarenal capsule in all but one the case showed a complete absence of the chromaffin substance.

In one instance only was a hemorrhagic condition found in the intestine.

Of the haemopoetic organs, the lymph glands showed rarification of the follicle lymphocytes, fibrous proliferation, formation of plasma cells and pigmented cells. The same was noted in the spleen where hemorrhages were also found. The bone marrow, after fatal doses showed regenerative and degenerative changes, after superfatal doses, a congestive hyperaemia and hemorrhages with a destruction of the lymphoid-myloid cells.

No cellular changes were found in the central nervous system.

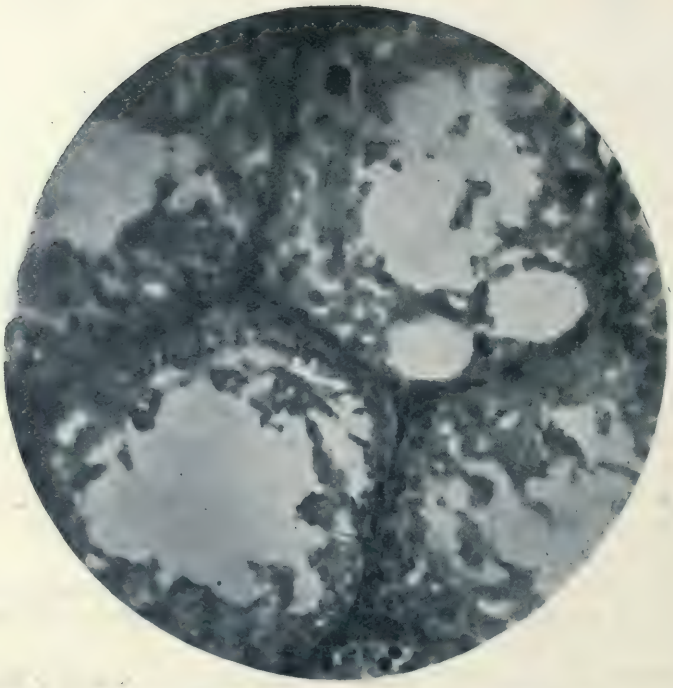

Figure V. Testicle. Rat receiving 100 micrograms of radium element. Showing complete destruction of spermatozoa and spermatogenetic cells. Leitz Objective 4. Ocular 4.

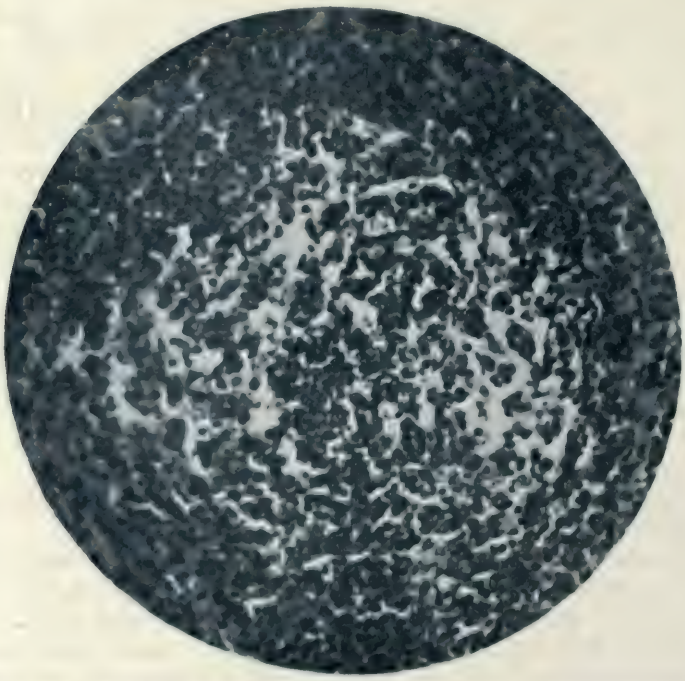

Figure VI. Spleen. Rat receiving 200 micrograms radium element. Showing perifollicular hemorrhage, rarification of follicle lymphocytes and endothelold transformation of same. Leitz Objective 5, Ocular 4.

The action of the radium may be characterized as follows:

It causes dilitation of the blood vessels and a congestive hyperaemia combined with hemorrhages and cell degeneration. The cell destruction seems to be due not only to the disturbance of the circulation but to a direct toxic effect of the radium. It is probable that the radium first injures the endothelial cells of the vessels, then diffuses through the walls of the vessels and comes in direct contact with the organ cells.

The most sensitive vessels in mice and rats are the veins of the liver, bone marrow spleen and lymph glands and small arteries of the lungs.

The most sensitive cells are those of the liver, bone marrow, pancreas and germinative cells of the testicles. Less sensitive cells are those of the lymph glands and spleen where radium produces a proliferation of the connective tissue with compression of lymphatic structures.

The kidney, suprarenal capsule and epithelium of the intestines and cellular elements of the central nervous system are relatively resistant.

COMPARISON OF THE TOXICITY OF THORIUM X AND RADIUM.

According to the experiments of *Pappenheim* and *Plesch*[13] there is no doubt that thorium X is considerably more toxic for the organism than radium. *Pappenheim* and *Plesch* experimented only on rabbits. It is to be regretted that no data relative to weights of the rabbits are given, consequently an exact comparison of toxicity per 1000 grams weight is impossible.

The following conclusions are of value only as approximate comparisons:

Pappenheim and *Plesch* injected rabbits with thorium X in quantities* of 3, 4, 7, 9, 10 and 20,000,000 mache units, also one rabbit was given intrastomachically, 9,000,000 mache units. On an average the animals died 4 days after injection.

The leucocytes disappeared entirely on the third day in the following order: lymphocytes, monocytes, eosinophiles, mast cells and basophiles. The most resistant and persistent were the polyneuclear-pseudo-eosinophiles.

Of the pathological blood cells there were observed a few plasma irritation cells, but no other premature cells.

The numerical variation of the red cells was not recorded.

The red cells showed a slight anisocytosis but no other degenerative or premature forms.

With sodium nucleate in the aleucocytic rabbit no leucocytosis could be produced.

The autopsies on these animals showed no macroscopical changes except in one case where subcapsular hemorrhages in the liver and hemorrhages in the kidneys were observed.

The spleen in some cases was atrophic and of a dark color.

---

*1,000,000 mache units of thorium X represents a weight of about 0.00001 mgm. of this substance. For purposes of comparison quantities of radium have been expressed in this same unit. One milligram of radium element corresponds to about 3,000,000 mache units.

The bone marrow in all the animals was dark red and softened.

The microscopical findings in the bone marrow showed a complete destruction of leucocytes with blood engorgement and free hemorrhages.

The most sensitive cells were the megakaryocytes and the granulated leucocytes while the premature lymphoid cells were most resistant.

The spleen and lymph gland showed similar changes consisting of more or less hyperaemia. In the spleen hemorrhages, and in both glands rarification of the follicle lymphocytes, endothelial transformation and fibrous proliferation of the stroma and formation of plasma cells were seen.

The parenchymatous organs showed a more or less congestive hyperaemia. In the liver there was found circumscribed necrotic areas and in animals receiving superfatal doses almost total necrosis of the liver cells.

The lungs showed a marked hyperaemia.

The suprarenal capsule showed a slight cell destruction combined with hemorrhages.

In the kidneys were found hyaline casts and changes in the glomerule.

In comparing the action of thorium X with radium we find changes of a similar character but less pronounced. While thorium X in comparatively small doses produces a complete leucopenia, radium in spite of tremendously large doses (10,000,000 m. u.) does not destroy all the leucocytes. There seems also to be some qualitative differences in the effect of thorium X and radium upon the leucocytes.

We found in superfatal doses that first the eosinophiles then the neutrophiles entirely disappeared, while the lymphocytes were still present at the time of death.

Pappenheim and *Plesch* found the lymphocytes to be most sensitive while the pseudoeosinophiles were most resistant.

The effect of radium on the bone marrow and parenchymatous organs is the same as that of thorium X but less extensive, but there is some individual and race differences to be considered.

The bone marrow in mice receiving 5,600,000 m. u. and in all the rats except the ones receiving 2,450,000 and 3,000,000 m. u., showed only slight changes consisting of clumping of the nuclei of the megakaryocytes and a slight decrease in the eosinophiles while the lymphoid cells were not changed.

The rat receiving the smallest dose (886,000 m. u.) showed an increase in the neutrophilic myelocytes. The rat receiving 2,450,000 m. u. showed a few small circumscribed necrotic areas but no hemorrhages, while the mouse receiving 10,390,000 m. u. showed an enormous but not complete destruction of the leucocytes with extensive hemorrhages. In a lesser degree the same was noted in the rat receiving 3,000,000 m. u.

Radium is relatively less toxic than thorium X for the bone marrow cells, as thorium X in fatal dose almost completely destroys the lymphoid and myeloid cells while radium in fatal doses seems to have a slight stimulating effect upon the neutrophilic myelocytes.

A complete destruction of the leucocytes in the bone marrow was not observed.

The effect of thorium X and radium upon the lymph-glands and spleen is almost identical.

Of the parenchymatous organs it seems that the liver in rats is the most sensitive, as in all, with one exception, multiple central necrosis was found. In the mice no necrosis was observed in the liver.

Thorium X seems to have a more intense action on the liver cells since in superfatal doses a complete necrosis of liver parenchyma was found.

Radium has no degenerative action on the kidney or suprarenal capsule while thorium X produced nephritis and degenerative changes in the suprarenal capsule.

The central nervous system seems to be relatively resistant to both radium and thorium X.

REFERENCES.

1. Bickel, Berliner klin. Wochenschrift, 1912, No. 8; 1913, No. 17.
2. Plesch, Berliner med. Gesellschaft, April, 1912.
   Plesch, Karczag and Keetmann, Zeitschrift fur Experimentelle Pathologie und Therapie and Vol. 12. Heft, No. 1.
3. Falta, Kriser and Zehner, 29 Deutsche Kongress fuer innnere Medicin, Wiesbaden, 1912. Ref. Deutsche med. Wochenschrift, 1912. No. 18.
4. Gudzent, Berliner klin. Wochenschrift, No. 30, 1912.
5. 1. c. No. 2.
6. Pappenheim and Plesch, Zeitschrift fur experimentelle Pathologie and Therapie. Vol. 12, Heft, No. 1.
7. Hirschfeld and Meidner, Deutsche med. Wochenschrift, 1912. No. 28.
8. Arneth, Deutsche med. Wochenschrift, 1913. Nos. 16 and 17.
9. Salle and v. Domarus,
   Strahlen Therapie, Vol. III. Heft, No. 1.
10. l. c. No. 2.
11. Gudzent, Berliner klin. Wochenschrift, 1912, No. 20.
12. Orth, ref. Muench. med. Wochenschrift, April, 1912.
13. Pappenheim and Plesch, Zeitschr. fur exper. Path. und Therapie, Vol. 12, part 1.

Reviews and Abstracts

Joseph B. *Bissell.* Cancer and Radium. International Journal of Surgery. Vol. 27, pp. 182-5 (1914). A record of six cases treated by the local application of radium. A case of spindle celled bone sarcoma of the left hip was treated with 40 milligrams, of radium (element), applied four hours and then for twelve hours a week later, in a sinus communicating between two openings on the leg. Before the second application of the radium the size of the tumor was reduced by half, and after the second application the pain was greatly relieved and the general condition showed improvement. After a third application of the radium the drainage tubes were removed and the openings of the sinus closed and cicatrized over. At present the man has improved in weight, and aside from a slight lump and a little tenderness over the upper cicatrix, is apparently in normal health. A second case was that of a recurrence of a sarcoma at the site of a scar over the border of the left scapular spine. The small ulcerated growth was removed, but there seems to be a tendency to infiltration of the skin, and so 40 milligrams of radium (element) were applied for two hours. After this application the discharge and the induration disappeared and three months later there is no evidence of any return of the growth, a white scar line marking the site of the operation wound. A third case still under treatment was an osteo-sarcoma involving the greater part of the femur. The applications of radium greatly relieved the pain and markedly lessened the discharge, the foul odor disappearing. The patient's general condition grew worse and the discharge increased again though without the offensive odor. Emaciation is marked and anemia is rapidly becoming worse. The fourth case was a recurrence of a squamous celled epithelioma of the upper eye lid. On admission to the hospital the growth was the size of a small bean. Ten milligrams of radium element applied locally for half an hour appeared to have no effect. A week later twenty milligrams of radium (element) were applied for two hours. This stopped the increasing growth and caused absorption. The growth was then removed and the site rayed with twenty milligrams of radium for eight hours. Primary union took place and a month later there was no evidence of the tumor or operation wound save a fine red line half an inch long, in the wrinkle of the eye lid. There was no evidence of burns or irritation of the eyelid or skin over the neighboring tissues. The fifth case was that of an ulcer (epithelioma) developing for twelve years and extending from the base of the right ear to the hyoid bone, being two inches wide. As there was a deep slough running to and over the exposed deep vessels of the neck it was decided that further operative interference was inadvisable and no radium was applied. Forty milligrams of radium (element) were applied first for nine hours and then ten days later for eight hours with the result that a month after treatment began the ulcer had practically disappeared and the patient returned home. The sixth case was an epithelioma of the larynx which was apparently cured by the local application of large quantities of radium (nearly a gram). The clinical diagnosis in the

above cases were confirmed by the pathological findings. In every patient including the one with the unsatisfactory outcome, the application of radium reduced the pain, lessened the discharge, and destroyed the foul odor, thus making the patient more comfortable. Then it also brings hope of a cure and if that is not possible, hope of freedom from pain and misery till the end.

* * * * *

G. Sterling *Ryerson*. Radium in Epithelioma and Allied Affections. The Canadian Journal of Medicine and Surgery. Vol. 35, pp. 264-6 (1914). A record of five cases of epithelioma of the face successfully treated with radium. The comment of the author is interesting. He says "radium, like all other proposed remedies for epithelioma, sarcoma, lupus and rodent ulcer, has had its ups and downs. It has been lauded beyond reason by some enthusiasts and decried as useless by others. The truth is, that given a sufficient quantity of radium and the technical skill required for its application, it gives in about 60 per cent of the cases treated excellent results. Like most beginners in its use, I at first undertook cases which were beyond its powers, because I was over hopeful and had not enough radium to get results. Now, after four years' experience, I know pretty well what I can do."

* * * * *

W. Sohier *Bryant*. Radium in Middle Ear Deafness Caused by Chronic Suppuration. New York Medical Journal. Vol. 100, p. 7 (1914). "In order to exclude the possibility of suggestion, the patient was given no knowledge of the treatment nor of what was being attempted. The mind of the patient was so dull that she was most unobserving. Radiation with mesothorium bromide was used at intervals of six days, five days, and six days. An applicator of five milligrams of mesothorium bromide was used; 262 milligram minutes of mesothorium bromide was used in the right ear, and 420 milligram minutes in the left ear. The radiation was the only treatment used."

"Results of the radiation.—After the first radiation, the tinnitus was relieved; after the first application, it stopped and it has never returned. After radiation, the Politzer acoumeter was heard by the left ear at eleven inches; in the right ear, the acoumeter was heard at twelve inches. The patient now hears the voice proportionately well."

"These measured tests of hearing are a gauge of her improvement in only one way. The radiation seemed to clear her mind to such an extent that she can now talk intelligently and she has a vivid interest in her surroundings. From a person almost totally deaf, inaccessible, and indifferent, she became observing and responsive."

* * * * *

Prof. Hermann *Freund* (Strassburg). Intraperitoneal Use of Radium. Deutsche med. Wochenschrift. Vol. 40, pp. 1252-4 (1914). This article opens up the wide field of the combination of Surgery and Radiation. The consensus of opinion is that radium has shown itself very much more effective in the case of uterine cancer than in cancer of other internal organs. *Freund* himself has found

radium and mesothorium the most effective (non-operative) means at our disposal for the treatment of cancer of uterus, vagina and rectum. His success aroused in him the ambition to extend its field with the help of surgery and to radiate more energetically by direct application to more deep lying growths. *Freund* has but one case to relate but his results were such that it should serve to stimulate further procedure in the same direction.

The case concerned itself with a woman in whom *Freund* had seven years before removed a cancer of uterus. The patient presented herself with a distinct nodule in the rectum the size of a walnut. The case was considered unsuitable for operation and *Freund* radiated it from the vagina for twenty-four hours, three different times with 100 mgms. mesothorium. The tumor and the surrounding infiltration of the connective tissue was absorbed without resulting disturbance of function. After eight months (i. e. at time of the introabdominal radiation) there was still nothing of it. Of this very striking performance *Freund* says, "We have nothing else at our disposal that could have accomplished this in an inoperable case and had I only this one remarkable success with radiation I should feel myself called upon to repeat the trial of it. But with such success repeated over and over, no one ought to be deterred by scepticism from following the path where radium points the way."

Eight months later the patient returned with much loss of weight and stomach symptoms. Glands along the spine were felt and the X-ray confirmed their existence. *Freund* determined to radiate them directly through an abdominal route. This involved the opening of the omental bursa and the establishing of a direct route to them. A *Miculicz* gauze bag was inserted so that the end lay against the glands, the open end brought out through the wound. The radium consisted of two applicators of 50 and 30 mgms. respectively, in a brass filter 0.3 mm. thick, enveloped in five times that thickness of gauze. These were pushed out to the extreme end of the bag and packed in position with gauze. The first day the exposure was seventeen hours, the second twenty-three and the third twenty-two hours when the radium was finally withdrawn. There was much vomiting which was relieved on temporary removal of tube. As an operative case there was no disturbance: healing by first intention and patient up on twelfth day. Three and a half months after operation the patient reported as in good general condition and the stomach symptoms improved.

From his pioneer experience in this case *Freund* sees a wide field open for the co-operation of surgery and radiation. He counsels experimental work on animals to determine the toleration of the peritoneum for radium. He emphasizes too, the importance of cross firing within the abdomen and would have used it had he had the sufficient amount of radium at his disposal. The vomiting while the radium was in the wound he is inclined to look upon as the direct effect of radium on stomach and intestine. In conclusion, *Freund* is pleased with his demonstration of the innocence of the radium within the peritoneal cavity and asserts that in the future, in all exploratory laparotomies, or in cases of partial

removal of new growths, he will have at hand radium and the means of applying it—some such applicator as his gauze bag or a rubber or lead tube.—S. *Delano.*

* * * * *

Robert *Abbe.* The Therapeutics of Radium. The Canadian Practitioner and Review. Vol. 39, pp. 197-212. (1914). An address delivered at the Toronto Academy of Medicine by Dr. *Abbe* of New York, and reported by Dr. J. F. *Goodchild,* dealing with the application of radium rays in the treatment of malignant growths, etc.

* * * * *

NOTES AND COMMENTS

We note the following in the British Medical Journal of August 1st, 1914, p. 264, in regard to the Manchester Radium Fund:

"The great success that has attended the appeal of the Daily Dispatch on behalf of the radium fund is shown by the fact that though 25,000 pounds was the sum originally aimed at, the fund now stands on July 27th at over 29,000 pounds, and donations are still coming in, while a number of the collecting boxes have still to be returned. The total for Manchester alone is well over 25,000 pounds, apart from subscriptions from neighboring towns. The contribution of Bury, for example, is over 2,600 pounds, and other towns have sent in various amounts. Last week the Manchester Y. M. C. A. promoted a radium fete and carnival, and though on account of the stormy weather some of the attractions had to be abandoned, a cricket match was played and the proceeds are expected to be considerable.

"At a meeting of the Radium Committee on July 20th, a hearty vote of thanks was passed to the proprietors of the Daily Dispatch for their invaluable services in bringing the fund so prominently before the public, and for the vast amount of trouble they have taken in order to secure the sum of money necessary to carry out the scheme. The question of the appointment of an expert radiologist was considered, and the appointment left in the hands of Sir William *Cobbett,* Professor *Rutherford,* Professor *Wild,* and Sir William *Milligan,* who will report to the general committee. A letter was read from the Oldham Hospital asking that it should be allowed to participate in the benefits of the scheme, and it was decided to suggest that Oldham might make a contribution to the fund of about 2,500 pounds, and in that case might be a sharer in the scheme. It was also resolved to spend a further sum of 10,000 pounds in the purchase of radium to be delivered as early as possible, and when the full amount now on order is obtained Manchester will be in possession of about 1,600 milligrams of radium bromide.

* * * * *

In the July, 1914, number of Mining Science, Mr. Howland *Bancroft,* a geologist of Denver, Colorado, writes on "Carnotite Lands in Abundance." Carnotite is the ore from which the greater part of the world's supply of radium is obtained. Speaking of the extent of these carnotite deposits Mr. *Bancroft* says, "the fact re-

mains that Triassic-Jurassic are found to outcrop at different places over an area of 40,000 square miles in Colorado and Utah. I do not mean to imply that these rocks are exposed over this large area, for this is not the case. In general they are overlain by younger rocks of the Mesozoic. However, they outcrop in enough places to warrant the belief that at least 40,000 square miles of southwestern Colorado and southeastern Utah are underlain by the Triassic—Jurassic. As mentioned above, the La Plata and McElmo formations of the Jurassic have thus far proven to be the most productive of carnotite ores. These formations outcrop where exposed by erosion in various localities throughout the area under discussion, but they form only a part of the Triassic-Jurassic series."

"I do not desire to create the impression that all of the formations of the Triassic-Jurassic series contain deposits of carnotite, nor do I wish to imply that wherever the La Plata and McElmo formations are found to outcrop vanadiferous and uraniferous mineralization will be found. I do, however, desire to inform your readers that there is the possibility of finding deposits of carnotite wherever certain well recognized portions of the Triassic-Jurassic sections are present. I have seen these horizons in so many different and widely separated localities, persistent over appreciable distances, that I have recommended to clients the payment of only nominal sums for claims, as there is so much favorable ground open for location. The current belief that "radium lands" in the Colorado-Utah field are restricted to a very small area is not borne out by geologic evidence."

"In view of these facts it is easy to comprehend that the impression that there exists a 'radium monopoly' is erroneous."

Mr. *Bancroft's* view in regard to the carnotite deposits is that which is also held by Mr. Thomas *Henahen,* State Commissioner of Mines in Colorado, and by many prospectors familiar with the situation. The officials of the Bureau of Mines, who wish to have these carnotite lands withdrawn from entry and have the Bureau of Mines undertake the production of radium, hold the view that there is only a very limited amount of the carnotite in Colorado and Utah. Legislation in regard to the withdrawal of these carnotite lands and having the Bureau of Mines take up the production of radium is at present at a standstill.

* * * * *

The 15th Annual Meeting of the American Roentgen Ray Society will be held in Cleveland, Ohio, September 9th to 12th, 1914. Thursday morning, September 12th, in a symposium on Hard Rays, Professor William *Duane* of Harvard University will speak on The Relation of Gamma Rays to X-Rays. Other papers dealing with the use of radioactive substances are: Radium as an Aid to Roentgen Therapy by Dr. Russell H. *Boggs* of Pittsburgh; and Personal Observations of the Use of Escharotics, Excision, Liquid Air, Carbon Dioxide Snow, Electric Sparks and Radium in the Treatment of Chronic X-Ray Hands by Dr. E. W. *Caldwell* of New York City.

We supply

RADIUM

SALT

In the form of

RADIUM BROMIDE RADIUM SULFATE
RADIUM CHLORIDE RADIUM CARBONATE

Radium Element content guaranteed

All Standard designs of Applicators

Radium Chemical Company

General Offices and Laboratories

Forbes and Meyran Avenues Pittsburgh, Pa.

Our Radium Chloride and Radium Sulfate (Standard Chemical Co.) have been accepted by the Council on Pharmacy and Chemistry of the American Medical Association.

STANDARD CHEMICAL COMPANY

PITTSBURGH, PA.

CARNONITE ORE

Miners of Uranium and Vanadium Ores, and Producers of Radium

STANDARD CHEMICAL COMPANY

BLETCHER-ANCHORS CO. PRINTERS, PGH.